

MICHIGAN TEST FOR TEACHER CERTIFICATION (MTTC)

TEST OBJECTIVES FIELD 087: INDUSTRIAL TECHNOLOGY

Subarea	Approximate Percentage of Questions on Test
Industrial Technology Fundamentals	33%
Power, Energy, and Transportation	18%
Manufacturing	13%
Construction	13%
Communication	23%

I. INDUSTRIAL TECHNOLOGY FUNDAMENTALS

001 Understand the design process.

Includes identifying components of the design process; recognizing the design process as a problem-solving strategy; applying design principles to solve problems; employing critical-thinking skills to evaluate alternative solutions to technological problems; and demonstrating knowledge of tools and materials used in the design process.

002 Understand systems and the interrelationships between industry, society, and other fields of study.

Includes analyzing a system in terms of its components; recognizing the interrelationships among integrated systems (e.g., communication, manufacturing, power and energy); evaluating procedures for monitoring and controlling systems; analyzing the connections between science and technology; and demonstrating an understanding of the effects of technology on society.

003 Apply principles of technical reading and writing.

Includes reading and interpreting charts, graphs, and flowcharts; understanding symbols and dimensioning; interpreting technical drawings (e.g., blueprints, electrical schematics); interpreting information from manuals and other references; and applying principles of technical writing.

004 Understand applications of science and mathematics in industry.

Includes performing basic calculations and unit conversions; calculating areas, volumes, and surface area; applying units of linear measure; using fundamental formulas (e.g., calculating board feet); understanding basic statistics; and applying fundamental principles of physics and other sciences.

TEST OBJECTIVES
FIELD 087: INDUSTRIAL TECHNOLOGY

005 Understand principles of measuring, marking, and layout.

Includes understanding procedures for measuring, marking, and layout using various materials; and using measuring devices, scales, awls, center punches, surface gauges, squares, dividers, and other measuring, marking, and layout tools.

006 Understand applications and operating procedures for hand and power tools.

Includes selecting the appropriate tool for a given application; recognizing proper maintenance and safety practices for various tools; and describing uses and operating procedures for commonly used hand and power tools (e.g., saws, sanders, chisels, routers, lathes, drills).

007 Understand properties of various materials and how these properties relate to a material's workability.

Includes recognizing the properties (e.g., hardness, density, strength) of various materials (e.g., woods, metals, plastics, composites); understanding the relationship between a material's properties and its workability (e.g., feed and speed); and applying principles for cutting, forming, fastening, and finishing various materials.

008 Understand health and safety requirements in industry.

Includes identifying principles of ergonomics and human dynamics in the design of systems, work methods, and work environments; recognizing principles of hazard avoidance; applying safety principles for the handling and storage of materials; and recognizing potential hazards related to manufacturing and construction procedures and equipment operation.

009 Understand the nature of careers in industry and principles of employability skills.

Includes identifying different types of careers in industry; describing the requirements for various jobs; understanding career planning; identifying important employability skills and traits (e.g., personal responsibility, honesty, ability to work in teams); and describing job-seeking skills (e.g., job research, résumé writing, interviewing skills).

II. POWER, ENERGY, AND TRANSPORTATION

010 Understand basic principles of electricity and electronics.

Includes applying terms (e.g., volt, ampere, ohm) and concepts (e.g., capacitance, resistance, impedance) used in electricity and electronics; analyzing components and properties of DC and AC circuits; and comparing and contrasting digital and analog circuits.

TEST OBJECTIVES
FIELD 087: INDUSTRIAL TECHNOLOGY

011 Understand the production, transmission, and control of power and energy.

Includes understanding devices for converting energy; describing the operation of an electric generator or electric motor; analyzing electrical power generation systems (e.g., coal, hydroelectric, nuclear); analyzing methods for transmitting mechanical energy and electrical energy; identifying devices for storing energy; and analyzing the use of energy in devices.

012 Understand basic principles, processes, procedures, and resources used in transportation.

Includes classifying and analyzing types of transportation systems (e.g., land, atmospheric, marine, space); demonstrating knowledge of power sources in transportation media; applying technical and scientific principles related to control, guidance, propulsion, and energy storage; analyzing a given transportation situation to determine appropriate applications or modifications of transportation technologies; identifying properties and uses of materials used in transportation systems; describing characteristics and applications of tools and test equipment used in transportation technology; selecting an appropriate tool for a given task; and understanding the safe and proper use of tools and equipment used in transportation systems.

013 Understand principles of motors and engines.

Includes analyzing the fundamental principles and operation of motors and engines; analyzing motor and engine systems; trouble-shooting and maintaining motors and engines; applying trouble-shooting techniques and procedures for automotive systems (e.g., fuel, electrical); applying procedures for service and maintenance; and understanding the safe and proper use of tools and equipment.

014 Understand the structure and function of transportation industries.

Includes identifying types of transportation industries; recognizing the effects of transportation industries on the economy; demonstrating a knowledge of federal and state regulations on the transportation industry; analyzing the environmental impacts of transportation technology; and analyzing the movement of goods, people, services, and information.

III. MANUFACTURING

015 Understand basic principles of manufacturing.

Includes understanding procedures for developing a product (e.g., research and development, prototypes); and applying principles for marketing and servicing products in both local and global markets.

**TEST OBJECTIVES
FIELD 087: INDUSTRIAL TECHNOLOGY**

016 Understand the materials, tools, and resources used in manufacturing.

Includes identifying, analyzing, and utilizing properties of materials (e.g., woods, metals, plastics, composites); applying criteria for selecting an appropriate material for a given purpose; and applying criteria for the selection and safe operation of tools and equipment used in manufacturing.

017 Understand processes and procedures used in manufacturing.

Includes utilizing equipment, processes, and procedures for casting and molding, forming, separating, conditioning, assembling, and finishing materials and products; evaluating the role of automation in manufacturing (e.g., robotics, computer-aided manufacturing); and applying and analyzing quality control procedures (e.g., statistical product control).

IV. CONSTRUCTION

018 Understand basic principles of construction.

Includes applying criteria for site selection; reading blueprints; recognizing and accessing building codes; applying procedures for constructing foundations, floors, walls, roofs, and other systems; understanding the environmental impacts of construction projects; and applying scheduling procedures for various construction activities.

019 Understand materials, tools, and resources used in construction.

Includes understanding properties and dimensions of various construction materials (e.g., wood, glass, steel, concrete, masonry); understanding devices and methods for fastening and bonding construction materials; selecting appropriate tools or equipment for various construction activities; and understanding the safe and proper use of hand and power tools.

020 Understand processes and procedures used in construction.

Includes demonstrating knowledge of terms related to structural components (e.g., studs, sheets, joists, trusses); and applying basic knowledge of rough and finish assembly (e.g., framing, drywalling, installing flooring).

V. COMMUNICATION

021 Understand principles of sketching.

Includes selecting and using sketching materials; understanding types and uses of lines; describing methods for sketching different shapes; applying principles of estimation and proportion; and understanding views, projections, and functions of sketches.

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FIELD 087: INDUSTRIAL TECHNOLOGY**

022 Understand principles of technical drawing.

Includes selecting and using technical drawing tools and materials; applying technical drawing conventions (e.g., dimensioning, lettering, lines, symbols); using various scales; understanding views (e.g., sections, auxiliaries); and applying technical drawing principles in industry.

023 Understand basic principles, processes, and procedures used in electronic communication.

Includes demonstrating a knowledge of computers and computer software; and analyzing principles and uses of electronic and telecommunication systems (e.g., television, telephone, satellite systems, computer networks).

024 Understand principles of computer-aided drawing and design.

Includes understanding the use of coordinate systems; applying basic CAD functions (e.g., snapping lines); describing the functions and applications of input and output devices; understanding storage and retrieval systems; utilizing menu tools; and applying CAD technology to solve problems.

025 Understand basic principles of graphic arts.

Includes identifying elements of graphic design (e.g., line, color, layout); identifying tools and materials used in graphic arts; analyzing equipment and processes used in photography; understanding basic processes used in desktop publishing; and analyzing the characteristics of various printing and imaging processes.

026 Understand the basic characteristics, components, and functions of computers and computer systems.

Includes identifying the characteristics and functions of computer components (e.g., input and output devices, storage and memory devices); understanding the types and applications of computer software; recognizing the types and characteristics of networks (e.g., LANs, WANs); understanding the characteristics and uses of the Internet and World Wide Web; and using computer technology to solve problems.